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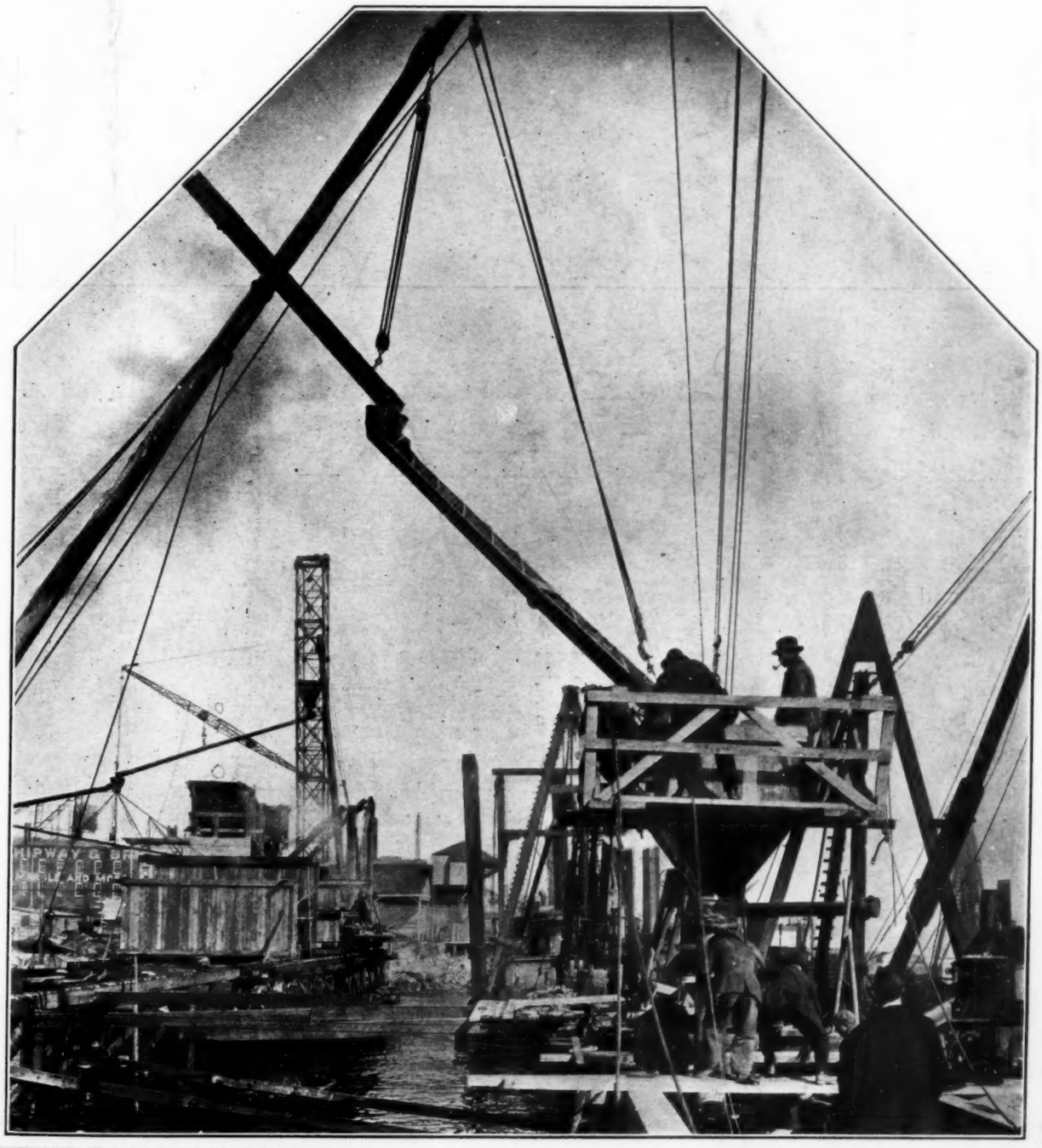
PUBLIC WORKS

CITY COUNTY STATE



TREMIE EQUIPMENT CONCRETING SECTION OF SEAWALL AT HELL GATE POWER HOUSE
CONCRETE SPOUTED FROM TRAVELING HOISTING TOWER TO TREMIE HOPPER

SEPTEMBER 17, 1921

Cleaning Streets in the City of Columbus Every Day

You have no doubt felt that someone would eventually make a vacuum street cleaning machine that would successfully take up all street refuse. You felt that it was possible because vacuum cleaners have been used successfully to clean floors and are now looked upon as a necessity

After many years of study and experimenting and with full knowledge of the limitations of all other similar machines, the O. M. E. VACUUM STREET SWEEPER has been perfected, thoroughly tested and is cleaning the streets of Columbus every day.

It works rapidly, cleaning from 3 to 5 miles an hour, creates no dust and the streets need no sprinkling or flushing. It is quiet in operation, handsome in appearance, sanitary and hygienic.

Write for details of tests and operating costs in actual operation on the streets of Columbus

The Ohio Municipal Equipment Co.

Columbus, Ohio

PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"
Published Weekly by Public Works Journal Corporation

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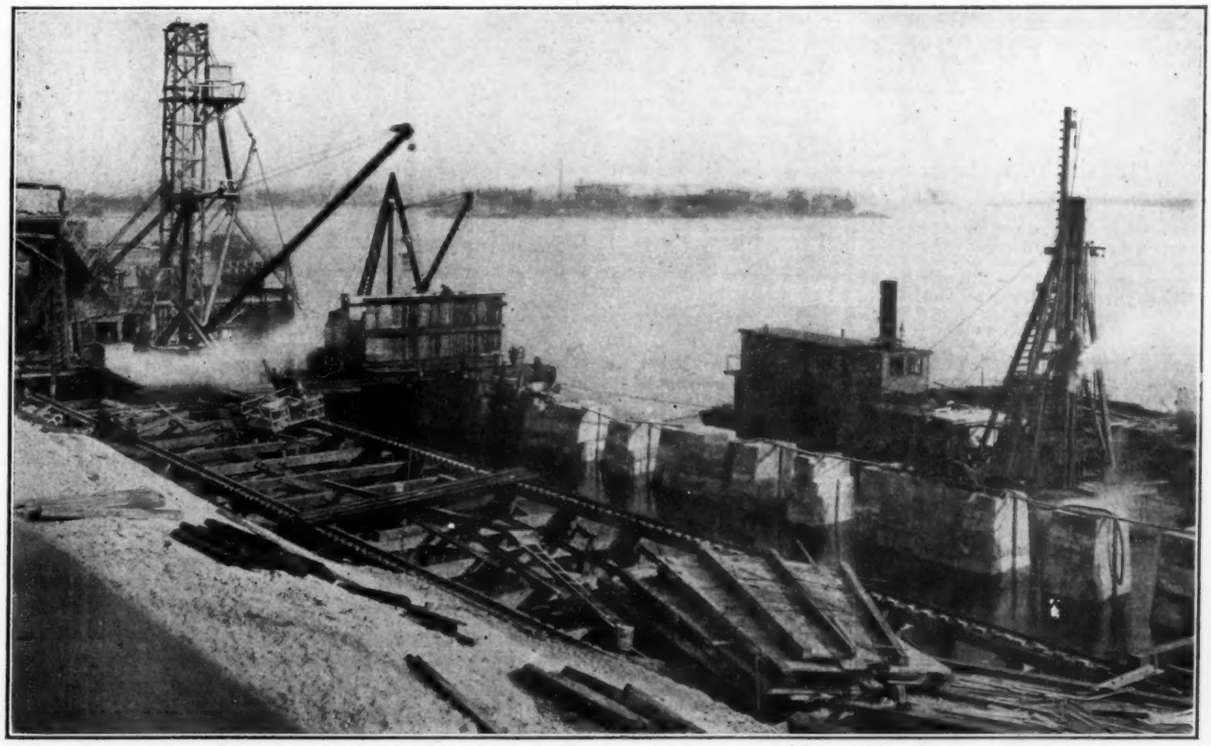
Vol. 51 SEPTEMBER 17, 1921 No. 12

Hell Gate Power House Tunnel and Wharf

Rectangular concrete discharge tunnel wall and river piers of wharf concreted under water on rock bottom. Tunnel floor, roof and core wall concreted in cofferdam formed by river wall. Extensive special plant installed for excavating submerged rock and for concreting under water.

Construction is well advanced on the 280,000 K. W. steam power plant of the United Electric Light & Power Co. on the west bank of the East river, between 132d and 134th streets, New York City, from which it is expected to deliver current during the early winter. The principal structures include a steel and masonry building 370 feet long, parallel to the river, that is 250 feet wide and 120 feet high and contains the turbine and boiler installation and the initial generating equipment, of which only one half the ultimate installation will be placed at present. Adjacent to the boiler room is the 105 x 212-foot 7-story electrical gallery building and between the main building and the river is the wharf about 480 feet long that is trapezoidal in plan with a width varying from about 24 to 70 feet. The massive concrete tunnel wall serves also as foundation for the river wall of the main building and to carry the shore side of the wharf, the river side of which



TRAVELER TRACK AND SECTIONS OF SEA WALL. WALL FORM PANELS IN FOREGROUND

is carried on 12 long and narrow piers transverse to the shore line and about 47 feet in extreme height. The paved concrete floor of the wharf is carried on steel beams and girders enclosed in concrete and resting on the piers and tunnel walls.

The condensing water discharge tunnel runs underneath the operating room for its full length and is parallel to the front wall of the building except at the upper end where it is placed at right angles and continues from the shore line to the bulkhead line and forms the outer edge of the wharf, and at the lower end where it makes an oblique angle from shoreline to bulkhead line. The regular cross section is 11 feet 6 inches wide and 15 feet 6 inches high inside dimensions, with the floor 10 feet below mean low water level. The floor slab, concreted on the rock bottom, is of varying thickness up to about 7 feet maximum. The river wall is 16 feet thick.

In the river wall, which is virtually a sea wall, there are imbedded 16 straight cast iron intake pipes 27 feet long, making an angle of about 49 degrees with the horizontal and having their lower ends clear of the base of the sea wall and cut off in a horizontal plane 12 feet below low water level. The corresponding vertical discharge pipes, 42 inches in diameter, are imbedded completely in concrete and the lower ends make right angle long radius bends, bringing the ends of the pipe into the vertical face of the tunnel wall. The tunnel may be oponed at both ends so that the discharge tunnel is substantially a covered canal with the upper part just below high tide level. The openings between the transverse piers that support the wharf beyond the wall are closed by vertical screens parallel to the sea wall engaging recesses in the piers and thus making a large covered intake open to the river and providing unlimited condensing water supply instead of restricting it to the capacity of a tunnel.

DREDGING

Over the entire area covered by the wharf and tunnel the bottom consisted of a Manhattan schist stratification, some of it nearly vertical, covered with from one to three feet of soft and hard mud, and water having a maximum depth of 14 feet at low tide, and about 20 feet at high tide, with maximum current of about 5 miles per hour. The upper part of the rock was so soft and decomposed that excavation to sound rock was necessary over the entire area and involved the removal of about 25,000 yards of submerged rock. Under the tunnel and an adjacent part of the wharf the rock was removed to an approximate depth of about 14 feet below low tide, descending by an almost vertical drop to a lower level where it had an approximately horizontal surface more than 35 feet below low tide.

CAISSONS

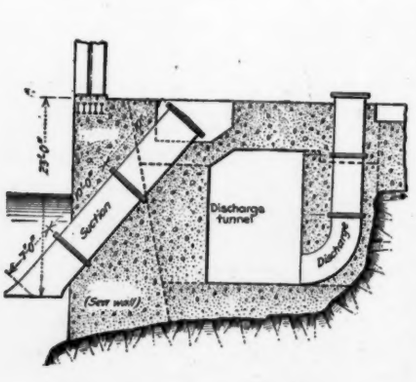
The sub-contract for dredging was awarded to P. Sanford Ross, Inc., who installed on the work two dipper dredges with buckets of 6 yards and 3½ yards capacity, respectively. These handled the soft material and the rock after it was broken by blasting and by the rock breaking machine, which had a 16 x 16-inch solid steel chisel about 35 feet long installed on a scow and operated up and down with a churning motion that was very efficient in soft and decomposed rock where it penetrated several feet.

Harder rock was drilled with 3-inch holes sunk at the average rate of about 30 feet per day by a single drill mounted on each of two drill boats. The holes were loaded in the usual way with dynamite cartridges inserted through casings and after the charges were fired the broken rock was removed by the dipper dredges that delivered it to attendant dumping scows that were towed out to sea where the rock was disposed of. No pains were taken to secure a uniform or strictly level surface and irregularities were preferred in order to make better bonding with the concrete.

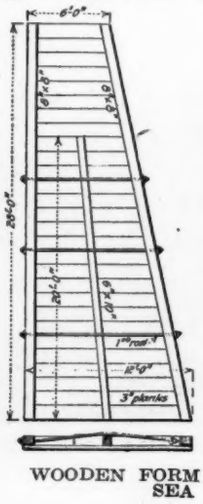
SECTIONAL CONSTRUCTION OF SEA WALL

The sea wall 480 feet long, 6 feet wide on top and 12 feet wide at the bottom has an extreme height of about 28 feet, reaching to an elevation of about 18 feet below mean low water, and was built in sections about 21 feet long, the alternate sections being first concreted in complete forms after which the intermediate sections were concreted between them and joined them together to make a continuous wall.

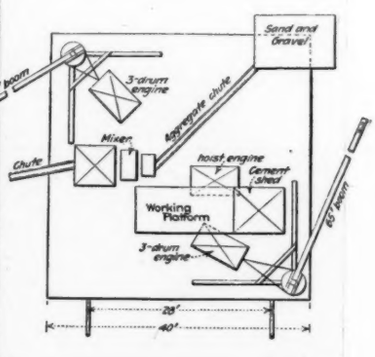
The forms 12 feet 9 inches long inside, were built complete on shore and swung to position by



TUNNEL AND SEA WALL



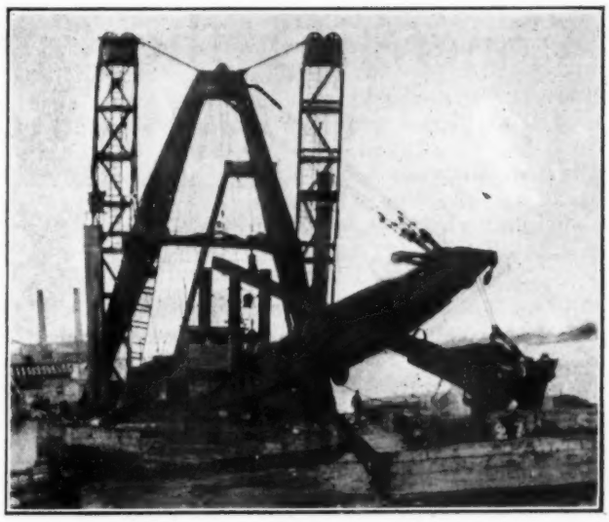
WOODEN FORM FOR SECTION OF SEA WALL



PLAN OF TRAVELER WITH CONCRETE TOWER

the derrick traveler. Each form was made with four wooden panels having 3-inch horizontal planks spiked to 6 x 10-inch vertical and inclined outside posts, one at each corner, which were reinforced with 10-inch channels bolted to their outer faces to give added stiffness and decrease bouyancy so that they would sink by their own weight when immersed. The ends of the forms were reinforced by an intermediate outside 6 x 10-inch vertical timber 12 feet long in the center of the panel, and by three horizontal tie rods located 6 feet, 12 feet, and 17 feet from the lower edge, which passed through the corner posts and were slightly bent to take bearing against the outer surface of the intermediate stiffening piece and thus developed a truss action. The vertical panel for the outer face and the inclined panel for the inner face of the wall were stiffened on the center line with a 4 x 10-inch vertical plank and a 15-inch channel which were bolted together with five 1-inch horizontal tie rods, passing through the form. The tie rods were cut a little short of the width of the form and at each end were connected by a coupling nut to a ¾-inch nipple, 10 or 12 inches long, that projected through the planking and the channel and engaged nuts and washers on the outer end. When the forms were stripped the nipples were unscrewed from the coupling nuts, permitting the tie rods to remain permanently engaged in the concrete.

The forms, weighing in air about 12 tons each, were placed in position where they rested on the irregular rocky bottom. They were inspected by divers, who cleared loose materials away from the bearing if necessary and nailed short vertical planks on the outer sides of the forms to provide



DIPPER DREDGE DELIVERING EXCAVATED ROCK TO SCOW

sheeting reaching down to the surface of the rock and held in position by sand bags carefully piled around them to close the larger openings and give additional stability.

The divers then entered the forms and cleared the surface of the rock with a water jet and by loading fragments of rock into buckets operated by the derricks, and removed mud, etc., by the suction of an 8-inch centrifugal pump.

After the alternate sections of the sea wall were concreted the forms were unbolted by divers and the closure sections of the wall were concreted.

(To Be Continued)

FRONT OF SEA WALL, ALTERNATE SECTIONS CONNECTED BY FORM PANELS. DERRICK TRAVELER WITH CONCRETE PLANT AND HOISTING TOWER

Concreting the Gansvoort-Schuylerville Road

Contractor quarries and crushes stone and stores more than 5,000 yards ready for beginning of season. Stone delivered over industrial track to aggregate bins and thence trucked to mixer. Total force of 130 men do heavy grading and average 300 feet of 16-foot concrete pavement per day.

There is under construction in northern New York state, along and near the west bank of the Hudson, from Gansvoort to Schuylerville, and in the village of Schuylerville, a concrete road totaling 9.63 miles in length which contains some unusual features of design and interesting details of construction method.

The greater part of this, 9.02 miles in length, is being built by MacArthur Brothers Company, of New York, and extends just to the village boundary. It is 16 feet wide on tangents, with additional width on curves, and is being built for the state. It is continued inside the village by a pavement 24 feet wide, of which 16 feet is paid for by the state and the remainder by the village. This totals 0.61 mile, in two sections, and is being built by F. F. Baker, of Mechanicsville, as contractor.

THE MACARTHUR CONTRACT

The larger contract was awarded in November, 1919, for a total of about $331,000. Some rough grading was done the following winter, there being considerable cutting and filling, one cut about 15 feet deep. In the spring of 1920 the work was organized and concreting was begun in June.

The contractor opened a quarry about a half a mile east of the road under construction (which runs approximately north and south), and about two miles south of the northern end. About 500 feet from the quarry two jaw crushers were established, fed by rock brought from the quarry by industrial cars. The crushers discharged directly by gravity into other industrial cars, or into a stock pile when cars were not being loaded. By the end of last season there had been accumulated a surplus of about 5,200 cubic yards of stone which was used in this spring's construction.

In going from the crusher, the train passed sand bins, where sand was received, and a little farther on the cement was added as the train passed the cement shed. Each car carried two buckets, each of which received a measured amount of stone and sand sufficient for one 4-bag batch. On reaching the mixer, the buckets were lifted from the cars by a crane attached to the mixer and dumped into the charging skip.

TRANSPORTATION

The industrial track was laid to the road and along the side of the road to the north end of the line, at which pavement laying was begun. Laying was continued south of where the branch to the crusher left the road until 22,100 feet had been laid. This was thought to be the limit of economical use of the industrial railway, and bins for stone and sand were built here and the industrial track taken up and laid south from this point—station 255. The aggregate was brought to the bins by trucks running over the new pavement. At the bins the tracks ran up onto a bank alongside the road so high that the trucks dumped directly into the bins. The trucks were furnished with bodies having an A bottom and side doors for side dumping. This method of operating was continued to station 100, when the use of industrial track was discontinued.

There is either cutting or filling over a large percentage of the length of the road, and this made it difficult to lay track alongside the road, and impracticable to locate switches less than 1,000 feet apart. This made continuous operation of the mixer impossible, and it was estimated that a third of its time was lost because of this.

Moreover, the grades were heavy, some of those of the original road running above 12 per cent (although 7 per cent was the maximum grade of industrial track) and the finished road having one grade as high as 9 per cent for a continuous stretch of a thousand feet. This cut down the number of cars the dinkie engines could haul to six or occasionally seven, although the same engines had hauled ten-car trains on Pennsylvania road work done by these contractors. Three dinkies were used and about 30 cars were on hand.

Station 100 was selected as the point for discontinuing the industrial track because the laying of the pavement toward the south had to be stopped here, the road south of this point sloping down on a 9 per cent grade, which was too steep to economically operate the industrial haulage system.

The laying plant and gang were accordingly transferred to the southern end of the contract and started north, and about a thousand feet of this had been laid at the time the writer visited the work. The stone is now brought by rail and is hauled to the work from a siding a short distance away by trucks. Sand also is hauled by trucks, from banks along the road where it is dug by the contractor. The aggregate is dumped on the right of way and loaded into the charging skip by wheelbarrows. The cement used is made in Glens Falls, about twenty miles away, and is brought to the work directly by truck.

CONSTRUCTION OPERATIONS

A Lakewood finisher had been used on most of the work; but most of that done recently has been

on curves, where the extra width (as much as six feet in some cases) made a pavement too wide for the finisher; and moreover on the curves the surface had a straight cross-section instead of crowned as on tangents. On the curves, therefore, hand finishing was employed, using a tamping template and belt, followed by drawing a rattan broom across the pavement to roughen it.

The concrete is being mixed by a "Milwaukee" 4-bag mixer, which turns out a batch in an average of 3 minutes, more than one minute of which is due to the bucket on the broom holding only half a batch and having to make two trips. Moving the mixer at intervals requires about two minutes. Water is furnished through a two-inch pipe by a "Domestic" gasoline pump drawing water from a pond.

The force consists of about 14 men on the wheelbarrows, an operator and a fireman on the mixer, 2 spreading, 2 tamping, 2 finishing, 1 cement man, and 5 to 8 others collecting cement bags, setting forms, grading, water boy and handy men, a total of about 31. This gang is averaging about 300 feet a day.

In addition, there are grading gangs, at which work about 80 men are just about kept ahead of the concreting gang. Three Fordson and two International tractors are used for hauling plows, Maney wheel scrapers and for other purposes. There is considerable shale rock along the route, which cannot be broken up readily by blasting but is very hard for picking. The total number of men employed on the contract runs about 130. Common labor is paid 30 to 40 cents per hour and works ten hours a day. Ten trucks are used, hired from local owners. The subgrade is rolled with a Charles Loudenecker road roller.

The road is given 7-foot shoulders made of soil only, on each side. In cuts, longitudinal drains are laid outside the shoulders, 6-inch porous tile being used in trenches 2 feet deep and filled with broken stone. From these side-drains 6-inch diagonal drains at 50-foot intervals run in alternately from the opposite sides.

Expansion joints are placed at intervals of 35 feet, solid expansion material being used. Reinforcement is placed at mid-depth, weighing 0.25 pound per square foot of pavement.

One day after completion, the pavement is covered with two inches of dirt thrown on from the sides and kept wet for ten days.

Guy Ripley is manager of the job for the contractors and Thomas Farrell is superintendent. D. P. Rookan is engineer in charge for the state.

THE BAKER CONTRACT

Owing to the width of the pavement in the village—24 feet, with a 4-foot shoulder on each side—it was thought impracticable to finish this in one strip, and it is being made in two 12-foot strips. A new feature is the longitudinal joint which is made with longitudinal corrugations, by placing against the middle form strips of corrugated 28-gauge steel 6 inches wide.

The reinforcement is heavier than on the other contract, being 0.3 pound per square foot. In addition, there is placed at each expansion joint (which joints are placed 60 feet apart) a steel rod ½-inch diameter set 6 inches back from the joint in each direction, the rod having each end turned back so as to lie 6 inches in from the side of the slab for a length of four feet. These rods weigh 0.85 pound per lineal foot.

The concrete is made of 6-inch uniform thickness with a 3-inch parabolic crown. It is finished off with a tamping template with plow handles on each end; rolled, and finally roughened with a broom.

This contractor uses a Jaeger 2-bag mixer which he has mounted on a light, low truck and provided with a chute. With this he averages 230 feet of 12-foot pavement a day, varying from 200 to 250. The gang includes 10 wheeling aggregate, 1 operator, 1 cement man, 3 men placing concrete, 2 finishers, a handy man, and a foreman.

Before concreting, an average of nearly a foot of old macadam was removed, about 2,700 cubic yards in all having been removed from the 0.61 mile. The subgrade is left undisturbed, the concrete being laid directly on the old macadam left in. Included in the contract was some 16-inch storm sewer with drop inlets at street corners.

F. Ray Williams is engineer in charge of this contract for the state.

Pennsylvania Highways Depend Upon Constitutional Amendment

At the coming primaries in Pennsylvania the voters are to adopt or defeat proposal for a constitutional convention, the purpose of which is to adopt a section authorizing the state to incur an indebtedness up to $150,000,000 for highways and up to $25,000,000 for forest purposes; no debt for highway purposes to be created, however, without the consent of two-thirds of each house of the general assembly and that of a majority of the electors of the commonwealth voting on the question.

The last of the $50,000,000 bond issue authorized in 1918 will be expended by the end of 1922, and from that time on the department will be dependent upon legislative appropriations, which are becoming more difficult to get with each succeeding session. A constitutional amendment was passed by the 1921 assembly for an additional $15,000,000 for highway construction, but unless a constitutional convention is held it will be necessary that this amendment be passed again by the 1923 assembly and then ratified by the electors in 1924, thus postponing until 1925 the availability of any money so provided for. With the proposed change in the constitution, an additional $50,000,000 bond issue could be made available by one vote of the assembly and ratification of the people, which would make the money available in 1923 or 1924, thus reducing to one or two years the lapse in intensive construction which would otherwise extend over three years.

Highway Commissioner Sadler states that it will require approximately 1,000 miles of highway or $50,000,000 of money, after the expenditure of the present available funds, to complete the primary road system of the state.

Yarhola Pipe Line

Installation of 558 miles of 6 and 10-inch screwed pipe with river crossing and telephone systems. Ditching 60 per cent executed by machines. Mississippi river crossing 3,000 feet long laid by derrick boat. Pipe bent to profile and joints screwed by traveling machines. Pipe tested by 850 pounds pressure.

The Yarhola pipe line, Sanderson & Porter, New York, engineers and contractors, was designed and built for the Roxana Petroleum Co. for the transportation of oil from Healdton oil field in south central Oklahoma 130 miles to a refinery at Cushing, Oklahoma and thence about 428 miles to the Wood River refinery at St. Louis.

It comprises a total of about 130 miles of 6 inch and 428 miles of 10 inch earth, covered steel pipe with screw joints laid to the natural profile of the straight line route and the St. Louis division is equipped with five intermediate stations, each with pumping installations and having a capacity for a daily delivery of 24,000 barrels of oil against a pressure head of 800 pounds.

The 6-inch line from the Healdton oil field to Cushing has a daily capacity of 12,000 barrels, and its construction was commenced in May, 1916. The general features and construction methods adopted for building it corresponded essentially to those of the 10-inch line 428 miles long from Cushing to St. Louis, the construction of which is here described.

The building of the line involved the hauling of 69,000 tons of material an average distance of 8.85 miles and a maximum distance of 21 miles. Besides the laying of the pipe line the contract included the construction of the pumping stations and the installation of their mechanical equipment with Diesel oil engines of 6,000 h.p. total capacity that were made in America. That the work was rapidly and successfully completed under adverse conditions reflects credit on the ability and resources of the engineers and contractors and of the manufacturers, The Allis-Chalmers Mfg. Co., who supplied the engines and the 12,000 barrel pumps; the National Transit Pump & Machine Co. who supplied the 8,000-barrel pumps; the Youngstown Sheet & Tube Co. who supplied the line pipes; the Crane Co. who supplied the steel valves and fittings and Henry J. Brandt, of San Francisco, who did the hauling.

ACQUIRING RIGHT OF WAY

Although condemnation proceedings are provided for by the laws of Oklahoma, they were not resorted to in this case, and the right of way, 20 ft. wide for the full length of the line, was acquired wholly by easements purchased from the property holders. A paper location of the line from terminal to terminal was made on strip maps compiled from existing government maps, surveys and other sources and showing roads, railroads, government sections, sub-divisions and some other data. These indicated the most convenient unloading points and highways for delivering and hauling materials and showed river crossings and principal elements of topography, verified and extended by a reconnaissance made in advance of the survey.

The survey was run providing stations and field notes with special reference to highways and to locations of corners of government subdivisions and permanent reference marks, all of which were carefully platted on the strip map with the final location of the lines.

The entire strip map was divided into short sections, and plats of each, showing the location and sub-divisions, were furnished to the right-of-way men who were specially selected for their skill, ability and experience in this work. They commenced operations by investigations in the recorder's offices where they made pencil abstracts of all desirable data regarding the land crossed, additional sub-divisions from sales and transfers, and secured the names of all the owners and the facts concerning mortgages, leases and other interests involved in the property.

Provided with these data, the twelve experts were engaged for a year in procuring the 2,000 necessary easements and about 6,000 other documents required to establish the right of way at a cost about equal to the sum actually devoted to the purchase of the easements from the property holders. All of this work was completed in advance of field construction and provided merely for the right of installation and of ingress and egress for maintenance, without including any property rights.

TELEPHONE AND CLEARING GANGS

In order that all construction parties should at all times be in communication with the head office, a telephone line was installed in advance of all other field construction. In general this line was established on the right of way, but in some cases where this was impracticable it was necessary to make detours so that the total length of the telephone line was approximately 650 miles, from the oil field to St. Louis.

Northern cedar poles 20 ft. long were delivered and placed 150 ft. apart on the right of way by the contractor who hauled the pipes. The poles, with brackets and insulators attached, were raised by hand by two pole gangs of about ten men each, that dug holes 3 feet deep and just large enough to receive the butts of the poles which were from 12 to 16 inches in diameter.

In earth, the holes were made in the ordinary way with crowbars and spoon shovels but where blasting was required, holes were drilled with jack-hammers operated with air from portable Chicago Pneumatic Tool Company's gasoline driven compressors, two of which were provided for the work. Blasting was done with 60 per cent. dynamite.

The pole gang also did the small amount of grading necessary for trimming the very steep sides of ravines and providing practical ingress and egress to highways. No other grading was required because the pipe was laid parallel with the surface of the ground, as elevations or depressions do not influence the pumping of the oil through the finished line.

The pole men were followed by ten-men gangs of wire stringers who under favorable circumstances advanced 3 miles per day, installing the wire, and guying and anchoring the angle poles.

The telephone crews were followed by the four clearing crews, each having a party of six to twelve men equipped with axes that cut the timber, burned the refuse, and removed the stumps by blasting with 40 per cent dynamite wherever this work was done by the contractor. Preferably arrangements were made with the owners or occupants of the land to clear the right of way, generally accepting the timber on it for payment or part payment of their services.

DELIVERY OF PIPE

The 427.79 miles of 10-inch pipe, plus the machinery and materials for the stations had a total weight of approximately 70,000 tons, which was delivered from the railroad to destination, an average haul of about 9 miles over dirt roads that were generally poorly graded and surfaced. The longest haul was 21 miles, the pipes being transported on pairs of wagons drawn by eight or more mules or horses pulling an average load of 1,500 pounds per animal.

The sizes of the loads were decreased and the difficulties increased by the fact that most of the streams too large for culverts were without bridges and had to be forded, and the existing culverts were in such poor condition that they very generally required repairs by the hauling contractor H. J. Brandt, San Francisco. Care was taken to deliver all pipe lengths, with their couplings attached to the east ends and to distribute them accurately, end to end on the right of way close to the alignment so that they required no longitudinal transfer and the minimum transverse movements for installation.

DITCHING

The pipe was laid in a ditch about 28 inches deep and 24 inches wide, about 25 per cent of which was located in rock that was drilled and blasted. The remainder was chiefly through cultivated and pasture land where about 15 per cent of the total amount was in hilly or rocky localities and the ditch was dug by hand. The remainder, amounting to about 60 per cent of the entire line, was excavated by two self-propelling Buckeye ditchers of the caterpillar type and equipped with electric headlights for night work.

These machines were provided with extra wide digging wheels of comparatively small diameter; operated by three men they were each capable of digging about 2 miles of trench per day under favorable conditions.

All of the spoil was deposited alongside the trench and after the pipe was laid, backfilling was accomplished by teams and special scrapers depositing the material in the trench without tamping or compressing.

SUBMERGED TELEPHONE LINE

A telephone line was carried across the Mississippi River in an armored cable 3,000 feet long, weighing 13,400 pounds and supplied by the Western Electric Co. The cable was wound on a large reel mounted on the deck of a barge that was towed across the river allowing the cable to unwind and sink to the bottom as it advanced. At intervals of about 75 feet anchors consisting of about 300 pounds of scrap iron were attached to the cable by galvanized wire bridles 50 feet long and prevented the cable from being swept down stream as it was laid, also maintaining it in position on the bottom until it had settled well into the mud and silt of the river bottom.

PIPE JOINTING

The sections of pipe 20 feet long, were jointed together by outside screwed couplings that were attached to one end of each piece as received. Where the topography permitted the field joints were usually made with machines except when additional gangs were employed to expedite the installation by hand work. In very rough and hilly country, the difficulty of handling the heavy machines made it more advantageous to couple the pipe by hand screwing with large pipe tongs. For this hand work there was required in each crew about 60 men who under favorable circumstances connected a maximum length of 2,500 linear feet in one 9-hour day.

There were installed on the work two pipe screwing machines built at Kansas City by the California Pipe Line Machine Co., each of them weighing 7,000 pounds, driven by a gasoline engine and operated by a total crew of about 40 men with a maximum record of jointing 8,200 linear feet of 10-inch pipe in one 9-hour day by 36 men who also made 24 bends and cleaned and painted the pipe. The 6-inch pipe of the Healdton-Cushing line was jointed entirely by the machines which had a record of laying 11,740 lin. ft. including 28 bends in one day with 26 men.

The joint screwing machine was mounted and traveled on the finished pipe where it was propelled by its own locomotive machinery. After the completion of each joint the pipe machine was moved 20 feet or one section length, to position for making the next joint, with the clutch overhanging the end of the pipe ready to grasp the forward section. While the machine was being advanced a man with a long pole pulled a full size oak plug through the last length of pipe, leaving it in the extremity to insure against any foreign substance being accidentally or maliciously left in the pipe. The plug remained constantly in the end of the pipe safeguarding it from the entrance of any obstructing material.

While this was being done, the next length of pipe in advance was lifted by six men who cleaned, oiled and served the screw thread with Crane's cement, and inserted it in the coupling while the forward end of the pipe was maintained in exact vertical position supported in a roller chain sling carried by a boom on the pipe screwing machine. The pipe thus supported was adjusted in exact alignment by another operation moving it as required transversely and maintaining it there while the clutch was attached to it, enabling the machine operator to start the engine and screw the pipe, penetrating the coupling about 2 1-4 inches. The last two or three turns were made with slow speed back gear drive on the clutch.

When the joint was completely screwed up an oak beam was inserted in the forward end of the pipe and its projecting end supported on a movable trestle about 2 feet high. The machine operator then lifted the pair of vertical legs from their bearing on the surface of the ground allowing the oak beam to take bearing support on the trestle while the machine advanced on the pipe until the clutch cleared the coupling and the machine legs were screwed down

again until they took bearing and picked up the weight of the pipe, releasing the oak beam and trestle and thus permitting the next section of pipe to be inserted and the operations repeated. The jointing crew was followed by a gang of four men that cleaned the pipe and coated it with a bitumastic protective compound.

PIPE BENDING AND LAYING

In order to conform as nearly as possible to the profile of the alignment and reduce the tension on the screw joints, the pipe was carefully bent to correspond closely to vertical curves. This was accomplished, without heating the pipe, by two bending machines that did the work in about one-fourth the time required for hand operations. This machine consisted of two clamps encircling the pipe and securely bolted to it, that were connected by a wire cable passing over a 25-ton jack operated by power transmitted to it through a shaft parallel to the pipe operated by the screwing machine. In this way the jack applied at the center of a pipe length would quickly bend it to an ordinate of from 2 inches to 3 feet as required.

As soon as the pipe was jointed, painted and bent, it was lowered into the trench in the quickest and easiest manner and in any convenient length, and allowed to adapt itself to bearing, special care being taken to give it as much slack as possible; in other words to make the pipe as long as could be accommodated in the wide trench so as to provide for contraction and thus reduce stress in the threads which might otherwise be stripped or develop leaks when the temperature of the pipe was materially lowered. The backfilling followed closely after the laying and care was taken sometimes to cover the pipe at night when it was as cool as possible. As the backfill was loosely placed in position and its depth was small, the pressure was not sufficient to interfere with the slight automatic adjustments in the alignment of the pipe. Excess length was guarded against to avoid the possibility of the pipe buckling and upheaving out of the trench if greatly expanded by midsummer temperature.

RIVER CROSSING

The crossing of the Mississippi River was made with about 3,000 feet of submerged pipe laid in three days by a crew of 20 men. The pipe was assembled in the usual way with screw couplings and without flexible joints, and was tough enough and possessed sufficient strength to endure without injury any installation stresses due to deflection and other construction operations. Each of the submerged joints was however reinforced or stiffened by an exterior sleeve about 42 inches long, made with three longitudinally flanged segments bolted together and firmly gripping the pipe and coupling.

At each end of the submerged portion there was also provided, to relieve stresses from temperature expansion and contraction, a special high pressure expansion joint having a spigot end inserted with packing in a long hub and both hub and spigot pieces connected by longitudinal tie bolts through cast steel flanges.

The pipe was laid with a derrick barge served by a smaller barge which delivered materials, both of them being moored in position by long anchor lines permitting them to be advanced as successive portions of the pipe were added. The anchors were moved and the material barge was handled by a small river steamer used as a tender.

The pipe was assembled on the deck of the derrick barge and the couplings were screwed up by four pairs of hand tongs operated while the forward or upper end of the pipe was held in position suspended from the derrick boom and guyed to cleats on the deck of the barge and the lower end engaged the last section of the jointed pipe projecting above the surface of the water in an inclined position supported on the edge of the boat.

As fast as the joints were screwed the pipe was painted, the reinforcing sleeves were bolted on over the couplings, the end of the pipe was lifted by the derrick, and the barge moved 20 feet transversely, allowing the pipe to settle below the surface ready for the addition of another section.

After the pipe was laid across the river, a preliminary test was secured by talking through the pipe from one end to the other. Conversations could thus be distinctly heard, proving that there was no external leakage. The strength of the joints was proved by subjecting the pipe afterwards to a hydrostatic test which it satisfactorily passed.

PRESSURE TEST

After the land pipe was assembled and laid and the trenches backfilled, it was subjected to an hydrostatic test of 850 pounds pressure per square inch applied in sections about 80 miles long reaching from pumping station to pumping station.

The first section was filled with water delivered to it by several hours operation of an auxiliary steam pump. After the pipe was filled the valves at both ends were closed, the tap screws in the summits were opened to allow the escape of entrained air, and were then permanently closed by steel screw plugs.

Pressure was then developed up to 850 pounds by the station pumps, recording pressure gages having been connected at both ends of the section. The required pressure was usually attained in a short time and was maintained while the line was patrolled and inspected for any leaks that might be disclosed. In such cases they were readily observed, notwithstanding the small amount of loose backfill, and were generally easily corrected by calking.

After the completion of the test, oil was pumped into the pipe displacing the water and forcing it into the next section beyond, where it became available for the hydrostatic test, thus effecting considerable economy of time and of water, the latter being rather scarce in this region. In this way the same water was used and re-used five times for testing the whole line. The work was executed under the direction of Wynn Meredith, a member of the contracting firm.

The total weight of the 2,300,000 feet of 10-in. pipe installed was about 48,000 tons, requiring for its shipment 1,264 freight cars that if made up into a solid train would have had a combined length of more than 10 miles. The greatest number of men simultaneously employed was 1,554, the greatest number of animals was 836; there was 6 motor trucks and 28 automobiles used on the installation.

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Submerged Rock Excavation and Concreting

The construction of one of the largest, most costly and up-to-date steam and electric power developments has included expensive submerged dredging, rock excavation and concreting in New York City, which has been rapidly and successfully executed at a cost of more than one million dollars, as described in this issue.

The location of this work where submarine appliances and all kinds of heavy construction plant and equipment were easily available, together with the services of expert contractors familiar with work of a similar nature, afforded an opportunity, which has been well improved, to do the work with the most advantageous methods and the most experienced organizations and suitable equipment that could be selected.

The work was done on a unit price, competitive bid basis and great pains and ability were devoted to selecting methods, arranging schedules, and to the installation and operation of plant to the satisfaction of the owners and to the advantage of the contractors, so as to assure the rapidity of first-class economical construction with a minimum of waste or unnecessary expense. Although the details of the plans may not fit conditions in other places, the general features exemplify advanced practice and satisfactory equipment for heavy work, and their principal features are subject to modification for other large jobs.

The quantities were large enough to justify considerable initial expense in the installation of plant to reduce the unit cost of the work and a broad-gage policy was adopted in the preliminary construction of two separate and independent traveling plants for the mixing, hoisting and distribution of concrete to all parts of the work by the spouting system, which eliminated service tracks, derricks, cableways and the like, and insured rapid continuous service at a small operating expense. This system also served for handling plant and materials, and after the completion of the work will yield a considerable percentage of salvage in the shape of standard apparatus and serviceable trestle timber.

Submerged rock was advantageously removed partly by a rock breaker and dipper dredge and partly by drilling and blasting, and the water jet and suction dredge were utilized for removing small fragments and cleaning the bottom surface.

The construction of the massive wall in alternate section, by tremie methods, permitted the use of simplified and smaller numbers of forms, which were designed to be connected and disconnected by divers, and insured the rapid construction of a satisfactory wall. Forethought in scheduling and building the sea wall and shore retaining wall enabled the permanent structure of the former to be utilized for the major part of a large cofferdam and permitted a large area to be unwatered for more rapid and economical excavation and the construction therein of a large amount of concrete work that virtually provided a discharge tunnel, built in the dry, and without any tunneling operation.

In the construction of the piers supporting the wharf beyond the sea wall, difficulties from the great irregularities in the depth of the water were overcome by building the land ends of the cofferdams (which were in shallow water) with wooden panels, and the river ends, in deep water, with steel sheet piles, permitting the cofferdams themselves to serve as forms for the concreting. Throughout the work the appreciation of local conditions and important requirements enabled opportunities and available resources to be well balanced for simple operations and rapid construction.

Discretion in Zoning Ordinances

Several zoning ordinances adopted during the past few years have given to some board or commission certain discretion in the enforcing of restrictions on building, for reasons explained by Edward M. Bassett in a paper published in the August 6th issue of PUBLIC WORKS. As he stated: "The strict word of the law may sometimes be the height of injustice. No zoning ordinance standing by itself can provide for the proper adaptation of the spirit of the law to each exceptional case."

In making provision for discretionary application of the law, however, local authorities should

make sure that they are not violating the law under which they act or surpassing their powers. As noted in the "Recent Legal Decisions" published in our September 10th issue, the village of South Orange, N. J., was held by the Court of Chancery to have invalidated its ordinance by providing therein that the board of trustees may use its discretion in granting permits for the erection of certain buildings in districts where forbidden by the general terms of the ordinance.

The state law granted to municipalities power to fix zones within which certain businesses and buildings may be forbidden, but it was held by the court that the restrictions must be imposed uniformly and must be obligatory upon all persons and property alike throughout the zone. "The discretionary powers reserved to the trustees by the ordinance to give to one and withhold from another the privilege of violating the ordinance is not conferred by the act."

Where state laws are so worded as to permit municipalities to provide for discretionary enforcement of specified restrictions it is, of course, legal and proper for them to do so. Most cities which have adopted zoning ordinances have found discretionary application necessary and it is probable that efforts will be made to change the New Jersey law in this respect.

Wilful Idleness

Following the public announcement of the president of the American Federation of Labor that the organization will resist to the utmost any reduction of wages and that laborers are entitled to "ice cream for their lunch and to automobiles to carry them to and from their work" and his appeal to the United States government to provide for 5,700,000 alleged unemployed in this country that the federation's demands should thus receive pay for little or no work, the New York Tribune has just published the result of an investigation made by it of the 500,000 said to be unemployed in New York City. Of this number 40 per cent are transients with their homes in other places. If these were eliminated the experts conducting the investigations report that the conditions would be little more than normal. They also report that a greater number of these unemployed are unwilling to work in hot weather or will not look for work at all.

The fact is that strike benefits, misplaced charity, and the tolerance of a long suffering public have encouraged the lazy, the discontented and the seditious in their dangerous and shiftless practices and a very large portion of the unemployed (who are in reality much fewer than are stated, probably not seriously more than normal) are idle through their own free will. Many of them demand exorbitant wages and are willing to do very little work in return. If they, as a class, would accept reasonable wages and endeavor to work vigorously and steadily, very few would fail to find employment. None would be idle if to this were added a reasonably efficient clearing house system for distribution of labor to different localities and different interests. There is no lack of employment and with reasonable and reliable labor a vast amount of production and construction would be resumed which would call for far more than the available present supply of labor and pay it excellent wages. There are today factories in New York unable to fill their urgent orders because they cannot possibly secure enough labor even at union or higher wages. Universal employment in this country chiefly needs the will to work and the unlearning of some of the pernicious customs that have spread so widely during the last few years.

Standard Size of Paving Brick

In spite of the standard specifications for paving brick adopted by the American Society for Municipal Improvements and the Society for Standardizing Paving Specifications, which specifications have been very widely adopted, it appears that the manufacturers are still called upon to turn out fourteen sizes and styles of brick. The National Paving Brick Manufacturers' Association has appointed a Committee on Elimination of Excess Variety, which committee met on August 30 with representatives of the United States Bureau of Standards, Department of Commerce and Chamber of Commerce to discuss the possibility of greatly reducing this number. At this meeting it was decided to call a conference of representatives of the principal engineering organizations to obtain their views of the matter.

As in all other industries, a reduction in the number of sizes and types of brick which manufacturers are called upon to turn out would undoubtedly reduce the cost of manufacturing, and a part, at least, of this reduction would probably be passed on to the consumer. In addition to this, both manufacturer and consumer would benefit by the larger stock of brick of each standard size that could be carried in stock and thus the greater promptness with which the consumer could be supplied. If the number of standards could be cut down to two or three, each manufacturer could carry a reasonable stock of each of these and supply any demand on short notice; whereas with ten or a dozen sizes and styles, his stock on many of these might be very low a considerable part of the time, although his stock as a whole might be as large as it was prudent to carry.

With demands for wire-cut brick, repressed, sharp edges, rounded edges, vertical fibre, etc., it does not seem possible that one standard can be adopted, but it does seem perfectly feasible to reduce the number to three or four, and it is to be hoped that such will be the result of the combined efforts of the various associations and departments now working to this end.

Road Work in Georgia

The state of Georgia has completed 62 new road projects in 36 counties at a cost of $3,000,000. In addition, 161 projects in 11 counties are under way involving an expenditure of $14,000,000, and plans are being prepared for 78 more projects in 53 counties at a cost of about $2,000,000.

Intensive Highway Work in Pennsylvania

The Pennsylvania state highway department will receive bids on September 27 for the construction of more than 63 miles of roadway divided into 30 projects. of which all except three or four are new. Of these 13 are one-course reinforced concrete, 12 are one-course reinforced concrete and hillside vitrified brick, while 5 offer an alternative between one-course reinforced concrete and a bituminous pavement—penetration bituminous macadam on a telford or broken stone base in one case, and bituminous surface course on a concrete foundation in the other four.

Municipal Bonds

Municipal bonds found a good demand and brought good prices during July and the first part of August, but the past month has seen the demand greatly diminished although the prices have continued favorable. Among the August sales were 5½ per cent bonds of Milwaukee, Oregon, Detroit, Toledo and the Philippin Islands; 6 per cent bonds of Milwaukee, South Dakota, Columbus and Toledo; 5 per cent bonds of Maine and Chicago, and the 4½s of San Francisco; these totaling $47,682,000 of the total $102,128,024 of municipal bonds sold during August. The sales for the first eight months of 1921 are reported by the "Bond Buyer" to have totaled $707,964,583.

Highway Telephone System for Missouri

The general manager of the Automobile Club of St. Louis, William King, is advocating the plan of placing a telephone box at each mile post along the main highways of Missouri, these telephones to be operated by central exchanges and to be used only by members of the automobile clubs maintaining the line, each member being provided with a private key for opening the telephone boxes. With such a system in operation a motorist who has experienced tire or engine trouble at a distance from a garage will always be within a half mile of a telephone station by which he can reach a service station in the nearest town. The plan contemplates. about 1,600 telephones on the main highways connecting the large centers of population.

Public Control of California Hydraulic Power

It has been estimated that more than 9,000,000 h. p. can be developed from the mountain streams of California, less than 2,000,000 of which has yet been utilized. The rapid rate at which private companies are establishing hydro-electric plants in the state has aroused the interest of many of the citizens, who feel that these companies will, if they increase much more in size, wield a dangerous amount of economic and political power. It is proposed that a bill be passed by the California legislature creating a state water power board and empowering cities or groups of cities to contract with this board for the construction of publically owned power plants, thus virtually putting the state's capital and borrowing power behind municipal power ventures.

Water Supply in Metropolitan Districts

The problem of supplying water to the population of metropolitan districts is much greater than that in less populous sections, not only because of the increased amount of water required, but because the dense and wide-spread population adds greatly to the pollution of the supply available.

In the metropolitan district surrounding New York City this is found to an intense degree. This area includes the northern part of New Jersey, and the accompanying map shows, by the shaded areas, that almost all of the northern part of the state is included in watershed areas supplying the communities of this district; while another large area is found south of Trenton. (Other areas in the section additional to those indicated by shading on the map are now being developed for supplying the rapidly increasing population.)

A consequence of including in the watersheds the fairly populous districts as well as the woodlands is that it is necessary to treat all of the surface waters to render them safe for public supplies. In New Jersey 46 per cent of the urban population is supplied with water that has been filtered and much of it has also been chlorinated, while 31 per cent of the surface water has been chlorinated only. Only 1½ per cent of the urban population receives surface water that has not been treated at all.

In addition to this treatment of the water supplies, the state is quite stringent in its requirements for the purification of sewage, there being more sewage treatment plants, we believe, in the state of New Jersey than in any other equal area in the United States.

Some of the communities, especially those along the coast, find it possible to secure sufficient water from deep wells, but in the northern part of the state, at least, only the smaller communities have found this possible. As there is no reason to believe that the conditions will so change in character as to lessen these difficulties, but on the other hand it is to be anticipated that they will be intensified, the necessity for intelligent, scientific and rigorous control of the water supply problems of metropolitan areas by state federal authority is becoming daily more imperative.

SHADED AREAS ARE WATER SHEDS OF PUBLIC SUPPLIES

Construction Questions Answered

Suggestions as to methods, "wrinkles"and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that others who have solved similar problems differently will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one.

How to Handle and Erect Girder Spans Without Special Equipment—VII*

With gallows frames, with moveable derricks and by floating.

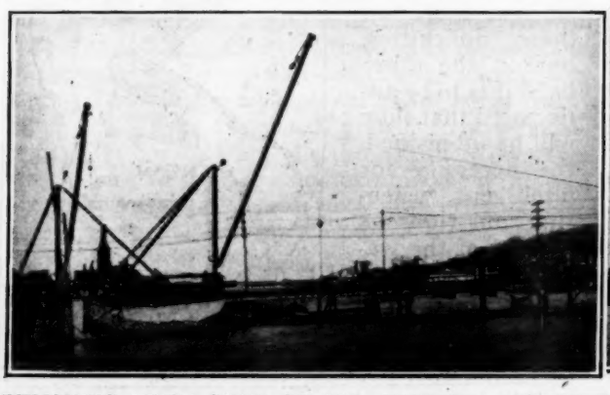
Some plate girders in a bridge over the tracks of the Pennsylvania Railroad Company at Newark, N. J., weighing 54,760 pounds each, were unloaded from flat cars and erected by two pairs of tackles suspended from two high special gallows frames, spanning two tracks and fleeted on the piers and abutments of the bridge. The caps of the gallows frames were made with two tiers of heavy timbers, supported on 12 x 12-inch vertical posts securely braced to full length outside 10 x 12-inch batter posts, both vertical and batter posts being connected by scabs to full length transverse sills. A pair of heavy tackles suspended from each gallows frame were connected to plate hooks engaging the top flanges of the girders and enabling the latter to be lifted and lowered and to be fleeted transversely from side to side of the gallows frame in order to clear the delivery track and set them in required position.

A very heavy 123-foot plate girder 9½ feet deep was unloaded from the cars in Philadelphia by a special gallows frame of unusually wide span, with three heavy tackles engaging yokes connected to the girder at the center of gravity by steel screw rods. The tackles were suspended from heavy oak ties placed across the top flanges of a set of 9 I-beams seated on a pair of plate girders that were borrowed from an adjacent structure and supported on timber bents about 70 feet apart, thus affording a wide clear span under which the girder was delivered on a skew track from which it was lifted by a locomotive hauling on the lead lines from the tackles. After the girder was hoisted clear of the car and the tackles removed, the girder was revolved horizontally around its center of gravity, and the ends being guided by tag lines, was lowered to position on the abutments, after which the tackles were moved in the gallows frame to a position over the center of gravity of the second girder, which was unloaded and erected in the same manner. The gallows frame itself was erected and dismantled by a large stiff-leg derrick.

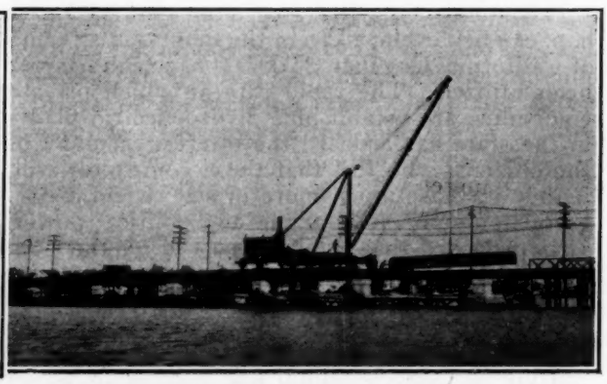
In central Ohio a considerable number of short span truss bridges were replaced a few years ago by plate girder spans, a part of which were of the through type with a maximum length of 90 feet and weight of 36 tons.

The old spans were removed and the traffic carried on trestle falsework on which the new girders were successively delivered, loaded on flat cars. The girders were received with their webs horizontal and were unloaded by two tackles attached to the top and bottom flanges at each end and suspended to the gallows frames seated on the piers and abutments. The tackles were operated to lift the girders free of the cars and after the tackles were removed the bottom flange tackles

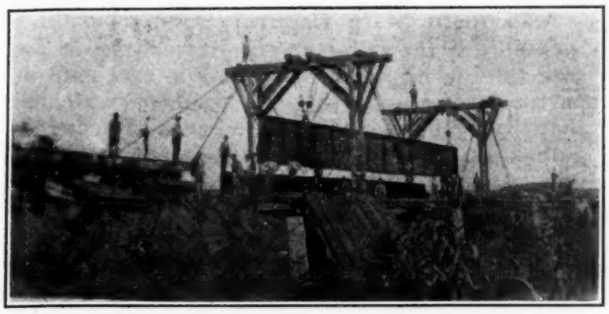
*Part I.—Transportation to site and erecting by steam protrusion was published July 3.
Part II.—Erection by cribbing, jacking, rolling and skidding was published July 30.
Part III.—With fixed derricks was published August 6.
Part IV.—With locomotive cranes, derrick cars and wrecking cars was published August 13.
Part V.—With locomotive cranes, derrick cars and wrecking cars, was published August 20.
Part VI.—With gallows frames, was published August 27.



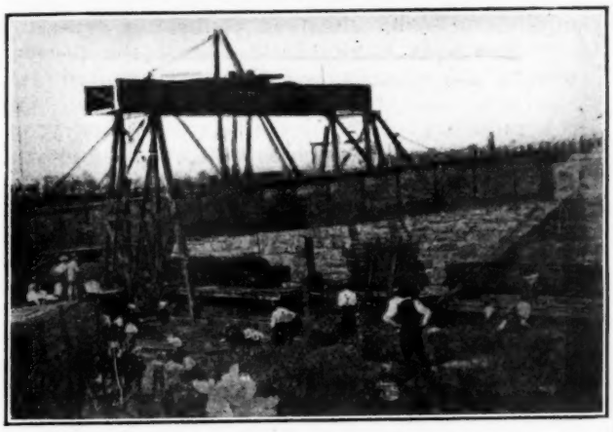
REMOVING FIRST SPAN OF OLD TRUSSES, ASBURY PARK BRIDGE



ERECTING 8TH SPAN GIRDER, ASBURY PARK BRIDGE



PAIR OF DOUBLE-BENT GALLOWS FRAMES WITH INSIDE AND OUTSIDE KNEEBRACES



ERECTING LONG PLATE GIRDER WITH TRIPLE TACKLES MOVABLE ON SPECIAL LONG-SPAN GALLOWS FRAME

were slacked off and the top flange tackles were operated to revolve the girder into a vertical plane and then the tackles were manipulated to fleet the girder to one side of the track and lower it to bearing on the substructure. The work was done with great rapidity, one girder being unloaded and seated on the abutment in six minutes. Only 10 hours were required to erect a pair of girders, complete the floor and remove the old span.

There were also deck spans having four plate girders, that were unloaded by the gallows frames and set outside the existing structures and jacked transversely into position, erecting the new spans in successive halves while the traffic was maintained on the old structure and the latter removed after it was transferred to the first half of the new structure.

The 114½-foot plate girders 9½ feet deep for the Janesville bridge in Wisconsin were unloaded by a pair of double-bent gallows frames with clearances 21 feet high above the track and 13 feet wide. The bents of the gallows frames were made with 8 x 16-inch horizontal caps and 12 x 12-inch plumb and batter posts, and were braced together 5 feet apart and seated on longitudinal sills supported on falsework piles at the elevation of the top of the masonry. Hand windlasses were installed on longitudinal timbers, supported by the double caps between which the hoisting lines from the windlasses were suspended.

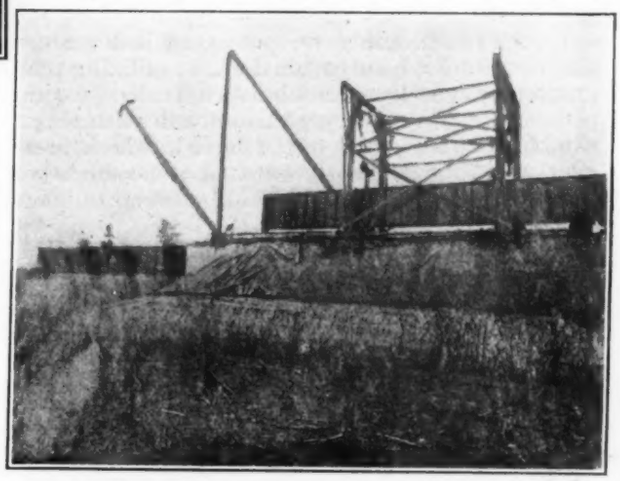
The gallows frames although independently stable were, for additional security, guyed together and were guyed to anchorages on shore.

The girders were lifted by the windlasses, the cars removed, the girders lowered to the substructure, windlasses shifted 6 or 8 feet on top of the gallows frames, girders again lifted and swung laterally, and the operations repeated until they were carried as far as required transversely and placed in their final positions.

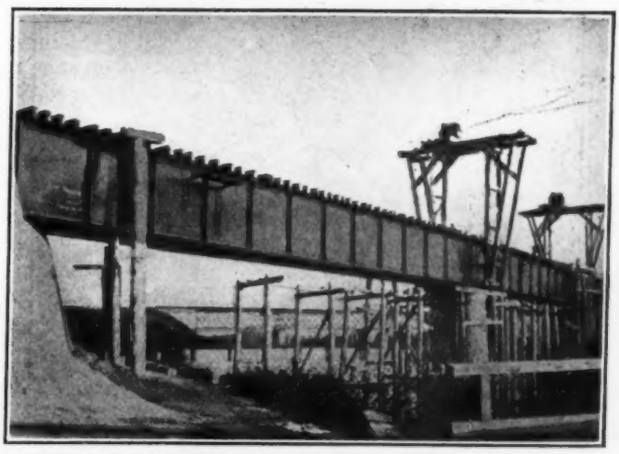
MOVEABLE DERRICKS AND FLOATING

The use of moveable derricks for girder erection differs from that of fixed derricks (described August 6, page 116) only in the greater convenience derived from ability to shift the plant quickly. A good illustration is in the case of the Asbury Park bridge renewal where old and new spans of the superstructure were rapidly handled by a moveable stiff-leg derrick installed on a flat car.

In the comparatively rare cases where girders can be delivered to the substructure on scows or barges, if the bridge floor is not too far above water level the girders may sometimes be unloaded and erected entirely by manipulation of their floats. If there is a sufficient range of tide the girders may be floated between the piers at high tide, and be automatically deposited on their seats by the falling tide which, continuing, releases the float and permits it to be removed. If there is no tide the same results may be attained by floating the girder to position slightly



UNLOADING HEAVY GIRDERS WITH PAIR OF GALLOWS FRAMES BRACED TOGETHER FOR INDEPENDENT STABILITY



ERECTING JANESVILLE BRIDGE GIRDERS WITH TWO DOUBLE BENT GALLOWS FRAMES

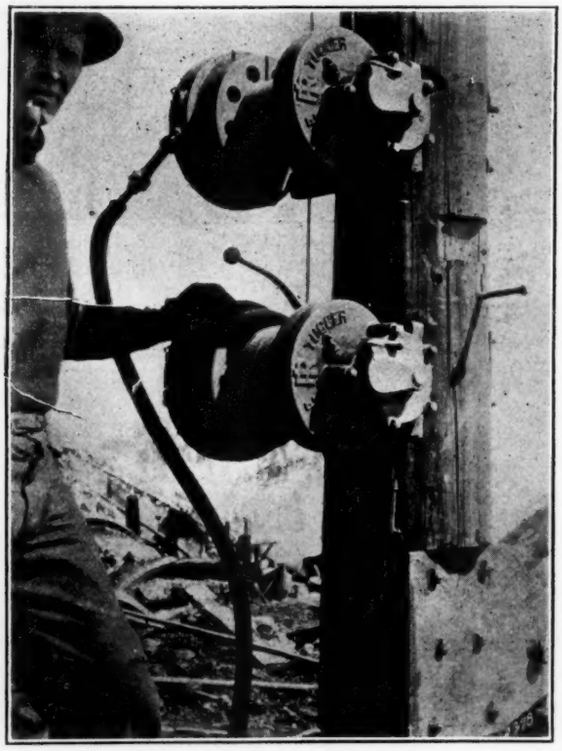
above the elevation of the permanent position and then sinking the float a few inches by the addition of water ballast.

Harvard bridge across the Charles river, Boston, has 23 spans from 76 to 106 feet in length, each with four main longitudinal plate girders. The single girders were riveted up complete at the bridge shop and taken on separate trucks to an assembling yard at the water's edge where they were stored and riveted together in braced pairs that were loaded on the deck of a special scow that was then towed to the bridge site and placed between the piers upon which it was gradually deposited by partly scuttling the scow with water ballast, easily secured by withdrawing plugs that closed special inlet valves in the bottom of the scow.

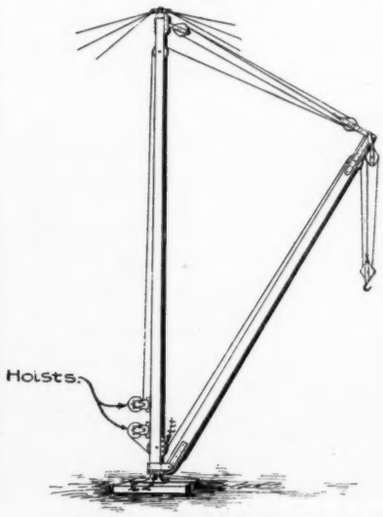
If the adjustment was unsatisfactory the rising tide still sufficed to raise the girders clear for a second lowering. The scow was then beached and the water automatically drained out of the valves at low tide, after which, before the tide rose, the valves were closed and the scow taken back to the assembly yard for another load next high tide. The conditions of manufacture and erection were unusually favorable in this case and were ingeniously availed of.

A Small Derrick Operated by Two Hoists

Under this heading we published last week a description of a home made derrick, utilizing telegraph poles and two small hoists operated by compressed air. We intended to publish with this a sketch and photograph of the derrick, which, however, were inadvertantly omitted and are shown herewith. The description will be found on page 199.



TWO COMPRESSED AIR HOISTING DRUMS, OPERATING MAST AND BOOM DERRICK



HOME MADE DERRICK OPERATED BY COMPRESSED AIR

Wisconsin State Highway Construction

Owing to the failure of the legislature to provide for the highway construction, the state department of engineering has issued a statement that it may be necessary to effect a radical reorganization of the entire department, and that plans to that end are now under consideration.

For the last three or four years the state highway construction in Wisconsin has been restricted, considerable unexpended balances of highway funds have accumulated and plans have been made for a large mileage of roadway. The present economic situation has reduced the price of labor and materials and there are now adequate supplies of both, which, in connection with the large funds available, have caused the present construction to progress at an unprecedented rate.

In June, 1921, the State Highway Commission had under way 310 miles of state highway concrete pavement, of which 51 miles were hold-over contracts and it is expected that the total construction for this season will be about 325 miles plus 1,200 miles of road surface with other kinds of material in addition to 600 or 700 miles of grading, making a total of about 2,200 miles of improvements.

There are now at work about 175 construction crews building gravel roads and 60 concrete paving mixers in operation that have a combined output of more than 3 miles per day. Five important jobs, including two concrete pavements, are being conducted by day labor operation.

The maintenance of the state trunk highway system is improved on account of the greater facility of securing good patrolmen and weather conditions that have permitted earth and light gravel sections to be put in shape. The county authorities are remiss in putting up the necessary detour signs. From June 12 to September 16 the highway department has published the Highway Information Service, blue prints of the state highway trunk systems, showing lakes, streams, places of interest and types of road, together with all construction jobs under way and detours marked good, fair, or poor, as the case may be. These are published weekly and sold to subscribers at $10 for the season, a sum which just about covers the actual cost. There are at present about 60 subscribers for this service, which it is expected will be inincreased to 100 and include hotels, garages and chambers of commerce.

The department has under construction $826,650 worth of bridges of a total length of 6,018 feet.

Recent Legal Decisions

STATUTE AUTHORIZING IMPROVEMENTS ON PETITION OF MAJORITY OF OWNERS HELD VALID

The Colorado Supreme Court holds, Gillum v. Town of Rifle, 197 Pac. 1017, that Rev. St., 1908, Sections 5359-5405, permitting an incorporated town to make public improvements upon the petition of the owners of a majority of the frontage to be assessed therefor, and affording such owners notice of the assessment for special benefits and an opportunity to be heard upon the quantum of the tax and upon its validity, is not in violation of the Fourteenth Amendment as depriving such owners of property without due process of law. The court followed Londoner v. Denver, 52 Colo. 15, 119 Pac. 156, which sustained a similar provision in the Denver charter.

CALIFORNIA MUNICIPALLY OWNED PUBLIC UTILITIES NOT SUBJECT TO RAILROAD COMMISSION

The California District Court of Appeals, First District, following City of Pasadena v. Railroad Commission of California, 192 Pac. 25, holds that the Public Utilities Act has no application to any public service carried on by a municipal corporation under the authority of the Constitution and laws of the state. Therefore it is unnecessary for a municipality, before constructing an electrical distributing system to supply the municipality and its inhabitants with electric energy in connection with its authorized aqueduct system, to apply to the commission for a certificate of public convenience and necessity.—Los Angeles Gas & Electric Corporation v. Department of Public Service of City of Los Angeles (Cal. App.), 197 Pac. 962.

METHOD OF DETERMINING MARKET VALUE OF WATER SYSTEM PURCHASED BY MUNICIPALITY

A city having elected to purchase the water works system built and owned by a water company in the city under the provisions of the ordinance contract between the parties, it became necessary to determine the purchase price which in equity and good conscience the city should pay. The federal district court for the District of Kansas holds, in a suit in equity for this purpose, Wichita Water Co. v. City of Wichita, 271 Fed. 973, that the replacement or reproduction method of ascertaining the fair and reasonable market value of a public utility property, such as that involved in this case, is the established method employed in the making of such ascertainments, if a fair and reasonable amount for its going value be added, and, having thus determined the replacement value from such aggregate sum, there is deducted such reasonable sum or sums as will fairly and justly measure the difference in value between the new plant so reproduced, with new materials used in the reconstruction, and the depreciation in value of the old plant, occasioned by long use, erosion, corrosion, and electrolysis of the mains, obsolescence, and, in short, all and everything which tends to lessen the life of the plant or depreciate the value of the old as compared with the cost of the newly constructed system.

It was held to be error to exclude the cost of recutting and replacing pavements over the water mains, although the pavement was laid by the city after the water mains were laid by the company. The court distinguished, on this point, the case of Des Moines Gas Co. v. Des Moines, 238 U. S. 153, 35 Sup. Ct. 811, where the Supreme Court of the United States did exclude from the replacement value of the plant involved in that case the cost of placing mains, pipes, etc., underneath the paving and macadam works of the city, for the reason that the question in that case was one of just rates of service to be charged the consumers of gas, and was not one as to the fair market value of the plant, based on its replacement theory.

RATES OF PUBLIC UTILITIES FIXED BY FRANCHISE ORDINANCE ARE SUBJECT TO LEGISLATIVE CONTROL

Rates or tolls to be charged by a public service corporation for services rendered, fixed by a municipality by ordinance as an incident to the granting of a franchise to it by such municipality, are held by the Florida Supreme Court, Town of Brooksville v. Florida Telephone Co., 88 So. 307, to be subject to legislative control.

PURCHASE OF PROPERTY BY MUNICIPALITY UNDER AGREEMENT TO IMPROVE IT

The West Virginia Supreme Court of Appeals holds, Whittaker v. City of Huntington, 107 S. E. 121, that a municipal corporation, whose charter empowers it to open, maintain, and control public streets and bridges within the city, to acquire, lay off, and control public grounds, squares, and parks for the convenience of its inhabitants, and to purchase, condemn, lease, or contract for the real estate necessary to effectuate such purposes, lawfully may enter into a contract with an owner of land within its boundaries whereby, in consideration of his voluntary conveyance to the city of certain portions of his property which he was preparing to develop, ornament and improve for the benefit of other land owned by him, in order to render it attractive to prospective purchasers of sites for homes, by the construction of bridges and boulevards and the opening and dedication of a public park thereon, the city undertook to complete and maintain such improvements, without further expense to him, and in accordance with a park and boulevard plan which it theretofore had adopted. Having acquired the property pursuant to such an agreement, it is held the municipality may not lawfully retain it and at the same time decline to fulfill its portion of the agreement, and the former owner, acting in good faith, may recover damages for loss sustained by the breach.

NEWS OF THE SOCIETIES

Sept. 12-26 — AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS. Wilkesbarre, Pa.

Sept. 19-21—ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION OF AMERICA. Chicago, Ill. Secretary, P. J. McAndrews, C. & N. W. Ry., Sterling, Ill.

Sept. 19-23—INTERNATIONAL ASSOCIATION OF INDUSTRIAL ACCIDENT BOARDS AND COMMISSIONER. Chicago. Secretary, Ethelbert Stewart, U. S. Bureau of Labor Statistics, Washington, D. C.

Sept. 19-24—ASSOCIATION OF IRON AND STEEL ENGINEERS. La Salle Hotel, Chicago, Ill.

Sept. 19-24—NATIONAL DRAINAGE CONGRESS. St. Paul, Minn.

Sept. 20-23—WEST VIRGINIA- KENTUCKY ASSOCIATION OF MINE MECHANICAL AND ELECTRICAL ENGINEERS. Annual convention. Huntington, W. Va.

Sept. 23—AMERICAN SOCIETY OF MECHANICAL ENGINEERS, METROPOLITAN SECTION. Enginering Societies Building, New York City.

Sept. 26-30 — ILLUMINATING ENGINEERING SOCIETY. Rochester, N. Y. Illuminating Engineering Society, Chicago Section, Chicago with National.

Sept. 26-30 — NATIONAL SAFETY COUNCIL. Boston, Mass.

Sept. 27-30—LEAGUE OF CALIFORNIA MUNICIPALITIES. Annual convention. Santa Monica, Cal.

Sept. 28 (10 Days)—NEW YORK ELECTRICAL EXPOSITION. Seventy-first Regiment Armory, New York City.

Sept. 23-Oct. 9—NATIONAL CONGRESS OF ENGINEERS. Buenos Aires.

Sept. 29-Oct. 1 — PENNSYLVANIA STATE ASSOCIATION OF COUNTY COMMISSIONERS. Annual convention. Harrisburg, Pa. Secretary, L. C. Norris, Clearfield, Pa.

Sept. 29-Oct. 1—AMERICAN ELECTROCHEMICAL SOCIETY. Lake Placid, N. Y.

October—IOWA SECTION OF THE AMERICAN WATER WORKS ASSOCIATION. Seventth annual meeting, Omaha, Neb. Secretary, Jack J. Hinman, Jr., State University, Iowa City, Ia.

Oct. 1-15—LYONS FAIR FOR PROMOTION OF INTERNATIONAL TRADE. Lyons, France.

Oct. 3-7 — AMERICAN ELECTRIC RAILWAY ASSOCIATION. Atlantic City, N. J.

Oct. 5-7 — SOCIETY OF INDUSTRIAL ENGINEERS. National convention. Springfield, Mass.

Oct. 8—BROOKLYN ENGINEERS' CLUB. Dinner. Chamber of Commerce.

Dec., 22-23—KANSAS ENGINEERING SOCIETY. Hutchinson, Kan.

Oct. 11-14 — INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual Convention, Atlanta, Ga. Hotel Ansley. Secretary, James J. Mulcahey, Municipal Building, Denver, Colo.

Oct. 11-14—AMERICAN ASSOCIATION OF PORT AUTHORITIES. Annual meeting. Seattle, Wash. Secretary, M. P. Fennell, Jr., 57 Common St., Montreal, Canada.

Oct. 12-14 — LEAGUE OF KANSAS MUNICIPALITIES. Annual convention. Lawrence, Kans. Secretary, John G. Stutz, University of Kansas.

Oct. 20-21 — CITY PAVING CONFERENCE. Engineers Club of Philadelphia, 1317 Spruce St., Philadelphia. H. E. Hopkins.

Oct. 20-21—OHIO STATE CONFERENCE ON CITY PLANNING. Annual conference. Columbus, Ohio. Secretary-treasurer — Charlotte Rumbold, Chamber of Commerce Building, Cleveland.

Oct. 24-28 — AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention. Southern Hotel, Baltimore, Md. Secretary, Charles Carroll Brown, Valparaiso, Ind.

Oct. 31-Nov. 5 — NEW ENGLAND ASSOCIATION OF COMMERCIAL ENGINEERS. Power show in connection with INTERNATIONAL TEXTILE EXPOSITION. Mechanics' Building, Boston, Mass. Secretary, James F. Morgan, Devonshire st., Boston.

Nov. 14-16—CITY MANAGERS' ASSOCIATION. Annual meeting. Chicago. Secretary, H. G. Otis, city mgr., Clarksburg, W. Va.

Nov. 14-18 — AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting. New York City.

Nov. 16-18 — NATIONAL MUNICIPAL LEAGUE. Chicago. Secretary, H. W. Dodd, 261 Broadway, New York City.

Nov. 17—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with Society of Naval Architects and Marine Engineers. New York.

Nov. 17-18—SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS. New York.

NATIONAL PORT PROBLEMS

Meetings to discuss National Port Problems were held pursuant to notices issued by the American Society of Civil Engineers, at the Engineering Societies Building, September 7th and 8th, 1921.

The principal addresses and papers scheduled to cover important features of the port interests included:

"National Phases of Port Problems," Frederic W. Cowie, Chief Engineer, Harbor Commissioners, Montreal, Que., Canada.

"Terminals," by Maj. Gen. Lansing H. Beach, Chief of Engineers, United States Army, Washington, D. C.

"Development of the Smaller Ports," by Frederic H. Fay, Member, Fay, Spofford and Thorndike, Consulting Engineers, Boston, Mass.

"Relation of Warehouses to Port Development," by M. A. Long, The M. A. Long Company, Engineers and Constructors, Baltimore, Md.

"Lack of Co-Ordination in Design of American Ports," by John Meigs, Consulting Engineer, Philadelphia, Pa.

"Brief Comparison of American and Foreign Sea Ports," by W. Watters Pagon, Consulting Engineer, Baltimore, Md.

"Some Observations on Port Finances," by Edwin J. Clapp, New York City.

"Improvement and Development of Ports," by Carroll R. Thompson, Assistant Director, Department of Wharves, Docks and Ferries, Philadelphia, Pa.

"Port Problems in New York," by John A. Bensel, Consulting Engineer, New York City.

"Relationship of Rail and Water Carriers," by W. J. Wilgus, Consulting Engineer, New York City.

"Port Administration," by B. F. Cresson, Jr., Chief Engineer, The Port of New York Authorities, New York City.

"Pier Designs as Developed from Quay Designs" (illustrated), by H. McL. Harding, Designing Terminal Engineer, New York City.

MINNESOTA BOARD OF REGISTRATION

The officers of the Minnesota Board of Registration for Engineers, Architects and Land Surveyors are Paul Doty, St. Paul, chairman; H. T. Downs, Minneapolis, secretary-treasurer, and N. Y. Taylor, Litchfield, vice-chairman. The other members of the board are: F. W. McKellip, F. G. Gorman, A. F. Gauger and Dwight E. Woodbridge.

PERSONALS

Routh, James W., has recently been retained by the St. Paul Bureau of Municipal Research as consulting engineer and is now engaged in studying problems connected with street cleaning and refuse collection in that city.

Trueblood, Edwin E., has been appointed county engineer of Douglas county, Kansas.

Moore, DeWitt V., engineer and contractor, has been made secretary of the newly appointed Engineers' Registration Board of Indiana.

Bennett, J. Gardner, instructor of civil and municipal engineering in the University of Wisconsin, has been appointed city manager of Fort Myers, Florida.

Murray, Charles W., formerly city engineer of Miami, Florida, has been appointed acting director of the Department of Public Service for that city.

Hobbs, W. E., surveyor for the Manitoba Good Roads Board, has been appointed controller of town planning for the provincial government of Manitoba.

Burch, A. N., project manager, Orland project, United States Reclamation Service, has resigned, after serving since 1908.

Snyder, Frederick A., has been appointed resident engineer on the New York-New Jersey vehicular tunnel.

Foster, Samuel D., has been appointed consulting engineer of the Allegheny County, Pennsylvania, Planning Commission.

Hagis, A. B., has been appointed city engineer of Jellicoe, Tenn.

Dryden, F. H., has been appointed city engineer of Salisbury, Md.

Harrington, W. H., has been appointed city engineer of Tracy, Cal.

McCreath, Gib, of Atkinson, Neb., has been elected county highway commissioner.

White, C. R., has been appointed to take charge of the pumping station of the new water works system in Scarborough township, Ontario.

Gaudet, Col. F. M., director of public safety for Montreal, has been appointed manager and technical expert of the Honorary Advisory Council for Scientific and Industrial Research and R. A. Ross has been appointed honorary chairman of the council.

Ducharme, Stanislaw, has been appointed member of the board of water commissioners of the city of Chicopee, Mass.

Meserve, Albert W., town clerk of Kennebunk, Me., was elected trustee for that town of the water district board.

Scheiner, Walter R., has been appointed city engineer of Salina, Kans.

Ridley, Clarence E., has been appointed city manager of Bluefield, W. Va.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

A LOCOMOTIVE GRAVEL EXCAVATING SCREENING AND LOADING MACHINE

The screening and loading machine manufactured by the Jordan & Steele Manufacturing Co., Inc., is designed to excavate sand or gravel from the bank or storage pile, elevate it to a screen and load the graded product into cars, dump wagons or trucks alongside the track on which the machine runs by its own power.

The machine has a steel tower with adjustable steel frames for the elevator and conveying mechanism and with its gasoline motor is mounted on a steel truck. Under favorable conditions it can be continuously operated producing a large quantity of uniform size sand or gravel with a minimum of time, cost, and hand labor. The excavation buckets in the elevator are driven by sprocket chains and can be set on the foot of the stock pile when the machine is stationary and is served by shovelmen or, under favorable conditions, it can be readily advanced taking a strip of material the full height of the bank that is to be cut.

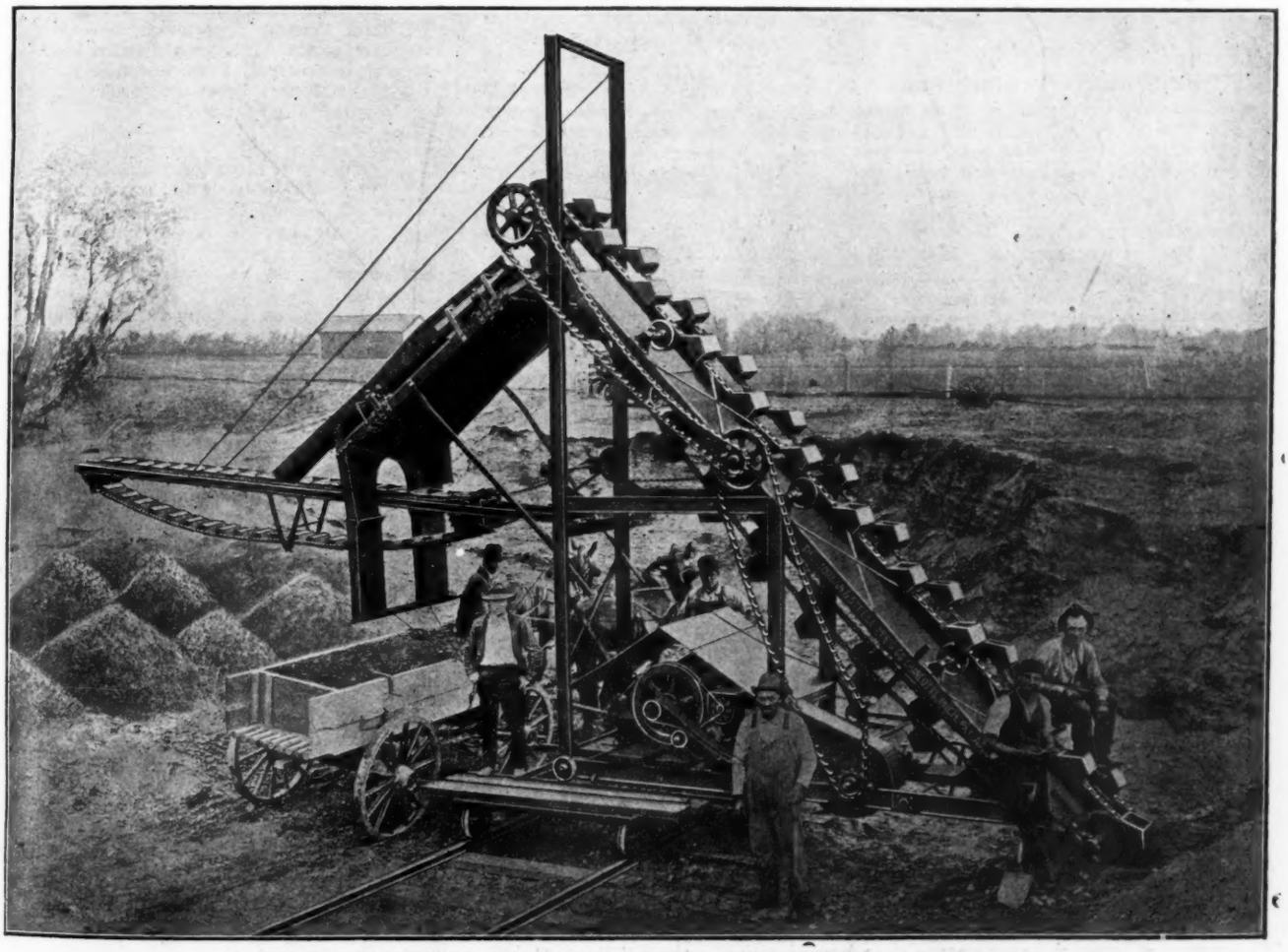
The machine delivers at sufficient elevation above the surface of the ground to enable it to fill buckets, cars, measuring boxes, trucks and wagons directly without the necessity for loading hoppers, storage bins or chutes and thus eliminates the installation and frequent shifting of such equipment. The large capacity of the machine makes it especially efficient on large concrete jobs and buildings where sand and gravel can be secured in local pits and delivered as required without involving rehandling or costly storage. It is operated by three men, has a capacity of one yard per minute, is not clogged by dirt or clay, and deposits the rejected material in piles clear of the machine.

SULTAN GASOLINE ENGINES, PUMPS, HOISTS AND SAW

Catalog 71 of the Whitman Agricultural Co., illustrates the Sultan contractors' equipment, including gasoline engines, pumps, oncrete mixers, saw rigs, hoists and boring tools.

The new Sultan engine has been especially designed for simple construction and for a service as nearly automatic as possible, to run without vibration, and noise and without requiring a licensed operator. The cylinders, of new design, have an improved cooling system, chilled cam gear, and a perfect timing device and circuit breaker. Has automatic regulation of speed by the fuel saving throttle control governor and the engine is dust proof and dirt proof and does not require housing. It is provided with an improved aluminum automatic carburetor and improved circuit breaker that is not affected by water or oil, is positive in action, cannot wear out or get out of order. The engine is made in 7 sizes of 1¾ to 8 h. p., with net weight of 200 to 900 pounds. It is recommended for operating concrete mixers and other kinds of contractors' equipment.

The Sultan double-acting power pump for street work, macadam roads and concrete work is made in four sizes, 2½ to 3 h. p., with a capacity of 900 to 1,750 gallons per hour to an elevation of 170 feet. It is mounted on a steel truck and can be operated at a cost of 35 cents for a ten-hour day.



MACHINE DELIVERING GRAVEL TO SCREEN AND LOADING AT GRAVEL PIT

The Sultan Imp portable force pump, especially designed to furnish water to concrete mixers, is made in three sizes, with motor or belt power, has a capacity of 275 gallons per hour. They also furnish a Sultan motor driven Imp force pump suitable for suction lift of 20 feet and tank pressure of 50 pounds.

The Sultan Atlas complete pumping plant to supply water for road construction has a double-acting pump that is made in three sizes of 1¾, 3 and 4 h. p. with a capacity of 650, 1,152 and 2,550 gallons per hour at a pressure of 75 pounds.

The Sultan direct drive power centrifugal pump with 2, 2½ or 3-inch suction and discharge pipes has a capacity of 150, 225 and 350 gallons per minute to a total lift of 30 feet. There is also a belt driven centrifugal pump made in nine sizes with suction pipe of 1 to 10 inches diameter and capacities up to 4,750 gallons per minute.

Sultan trench or diaphragm power pumps are made in four sizes with capacities from 3,500 to 6,000 gallons per hour. They are mounted on steel trucks, driven by a gasoline motor and are very effective for trench pumping and for handling water, lifting mud, sand or gravel.

The Sultan builders' reversible gasoline engine hoists are built in three sizes. Geared 9 to 1 or 12 to 1 and are suitable for general construction purposes, pile driving and other contractors' operations.

HEIL GRAVITY DUMP BODY

The Heil Gravity Dump Body manufactured by the Heil Company and sold by them for $100 to $120, is a 1 to a 1½-yard electrically welded watertight body, designed to secure a maximum dumping angle and simply constructed with a total of only 21 parts. It can be mounted on any kind of truck and gives best results when installed on a short wheel base truck with pneumatic tires. It is especially servieable for concret road building. It can be used equally well in the country or in the city and the bodies can be easily removed, making the trucks quickly available for other purposes.

Wet concrete is especially easily handled by it, for the driver is able to trip the body without leaving his cab. The body rolls oer by gravity to a dumping angle of 80 or 90 degrees when the heavy control springs stop the movement without injurious jerk to the body or chassis. Afterwards the control springs help to restore it to the raised position.

In the raised position the front of the body rests against the stop that locks it and holds it firmly in position. The single bodies are made in four sizes, weighing from 390 to 475 pounds. Dual Bodies ranging in capacity from 1½ yards to 3 yards are fastened to a special subframe so that they can be mounted on any make of truck.

HAVEMEYER CURB-BARS

The Havemeyer round nose curb-bar weighs about 1½ pounds per linear foot and has a T-shape cross section with curved flanges and a straight web ¾ inch wide from which project anchors 2¾ inches long and 6 inches apart on centers. The anchors are staggered, that is, bent in opposite directions, for secure bond with the concrete. The curb-bar has no sharp edges so that no fillet is formed where trowelling takes place.

The bars are easily installed with the aid of soft wire ties hung on nails driven in wooden forms. The bars are made in 10 and 12-foot lengths, galvanized, and make neat compact bundles. For curves they can be readily bent without kinking. This can be done by contractor or will be done before shipping if so ordered.

The Havemeyer angle nose curb-bar is rolled from 1¼x1¼x3-16-inch angle with anchors 6 inches apart and 2¾ inches long sheared and punched from the top flange of the angle which is also provided with three rows of lugs to preent slipping. The bars weigh 1½ pounds per linear foot, are stocked in 10-foot lengths galvanized and cut to lengths or bent on order. They are used for shipping platforms and for stair nosings.

INDUSTRIAL NOTES

W. H. Schimmel, formerly engineer maintenance of way, Monongahela Valley Traction Co., Fairmont, W. Va., is now chief engineer of the Keeley Construction Co., Clarksburg, W. Va.

Dudley & Gleaser, Manchester, N. H., is a new firm of consulting civil engineers recently organized to specialize in water-supply and sewerage design and construction.

Barto-Phillips Co., engineers and builders, New York, has been organized to engage in the engineering design, construction and exportation of all classes of industrial buildings, including power house equipment requirements.

The Ideal Sand and Gravel Company, Mason City, Ia., has a plant with a capacity for excavating, washing and sorting 375 tons per hour of sand and gravel from a 260-acre deposit, which is being worked with three 1½-yard and 2½-yard dragline buckets delivering into 50-yard standard gauge, bottom dump cars hauled by locomotives to a track hopper from which the material is elevated to be crushed and then passes through revolving screens and washing bins and on to the storage yard of 75,000 tons capacity.

The Cochrane Steam Specialty Co. of Massachusetts has been organized with offices in Boston to represent in New England numerous well-known manufacturers of power plant equipment, including H. S. B. W.-Cochrane Corp., the Steam Motors Co., Inc., and the D. Connelly Boiler Co.

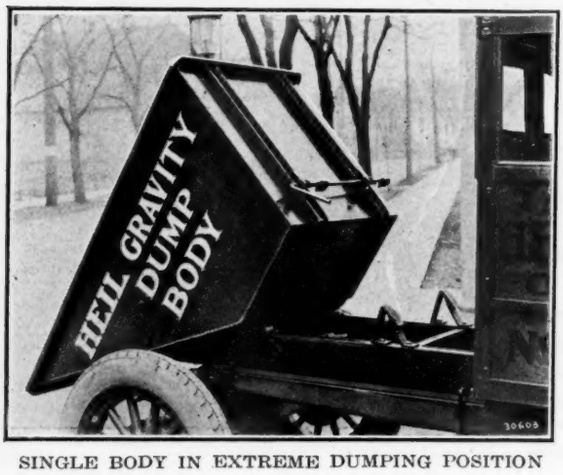
J. D. Ackenheil, formerly with the Portland Cement Association as field engineer in the Pittsburgh district, has been appointed special representative for the Heltzel Steel Form and Iron Co., of Warren, Ohio.

RANSOME EQUIPMENT EXPORTED TO JAPAN

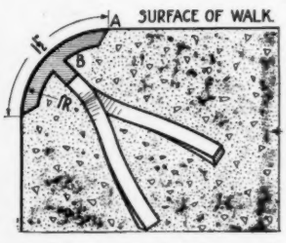
The Ransome Concrete Machinery Co. has just completed boxing three paving mixers for shipment to Japan. It is evident that this is the start of a large program in the Flowery Kingdom.

They have recently shipped to Japan for hydro-electric work six Ransome-Canniff concrete mixers and placers and several Ransome-Canniff grout mixers and placers.

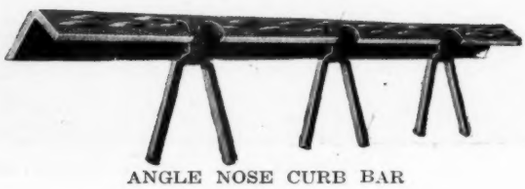
They have also recently shipped four 14-S mixers with gasoline engine, power loads and automatic water tanks to the Japanese army, to be used for the construction of new fortifications in Japan.



SINGLE BODY IN EXTREME DUMPING POSITION



ROUND NOSE CURB BAR



ANGLE NOSE CURB BAR